

Programming Foundations

DGM 6108

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Title:

What affects my Energy Levels?

Overview

For this final visualization, my Hypothesis is: As the number of steps, I walk increases, my Energy Levels during the day increases. I have decided to find a link between my number of steps and Energy levels, with the support of other factors like my daily Calorie Consumption and Water Intake. I have been collecting data for the last 8 weeks, and I included other elements which I did not end up using in my Hypothesis. For this hypothesis, I worked with Scatter Plots, Heatmap and creating a Visualization with different shapes. Finally, I decided to use a Scatterplot for making the visualization, but I have decided to make it Interactive. Since my data was numerical, I decided Scatter Plot would be a good approach.

The total list of all my data is as follows:

- Date (DD/MM).
- Temperature of the day (in K).
- Time (Recorded data at 8am, 1pm, 6pm and 11pm).
- Steps Walked (In thousands).
- Food Intake (Kilo Calories)
- Water Intake (Liters)
- Energy Levels (0= Lazy to 5= Energetic)

The data that I ended up using for the final visualization is as follows:

- Time (Recorded data at 8 am, 1 pm, 6 pm and 11 pm).
- Steps Walked (in Thousands).
- Calorie Consumption (Kilo Calories).
- Water Intake (Liters).
- Energy Levels (0= Lazy to 5= Energetic)

Data Collection

I have collected my data in a tabular form in an excel sheet.

Here is the link for the dataset: [Data](#).

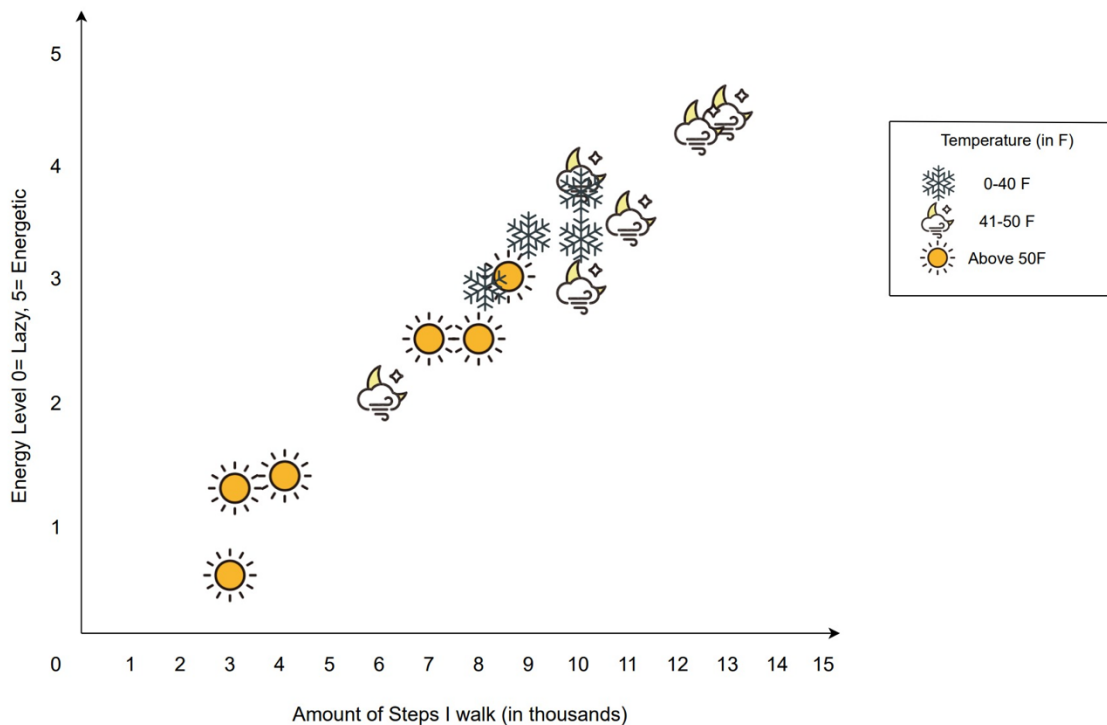
Here is how it looked in a JSON format:

```
1  [
2    {
3      "steps": "1",
4      "energy": "2",
5      "water": "0.25",
6      "calorie": "400",
7      "date": "02-11",
8      "category": 0,
9      "time": 8
10   },
11   {
12     "steps": "5",
13     "energy": "2",
14     "water": "0.75",
15     "calorie": "1000",
16     "date": "02-11",
17     "category": 2,
18     "time": 13
19   },
20   {
21     "steps": "7",
22     "energy": "2",
23     "water": "1.25",
24     "calorie": "1200",
25     "date": "02-11",
26     "category": 2,
27     "time": 18
28   },
29   {
30     "steps": "10",
31     "energy": "3.5",
32     "water": "1.5",
33     "calorie": "1800",
34     "date": "02-11",
35     "category": 3,
36     "time": 23
37   },
38   {
39     "steps": "1",
40     "energy": "1",
41     "water": "0.5",
42     "calorie": "380",
43     "date": "02-12",
44     "category": 0,
45     "time": 8
46   },
47   {
48     "steps": "4",
```

Initial Ideas.

1) Scatterplot

Visualization of my dataset and hypothesis started with a simple scatterplot.

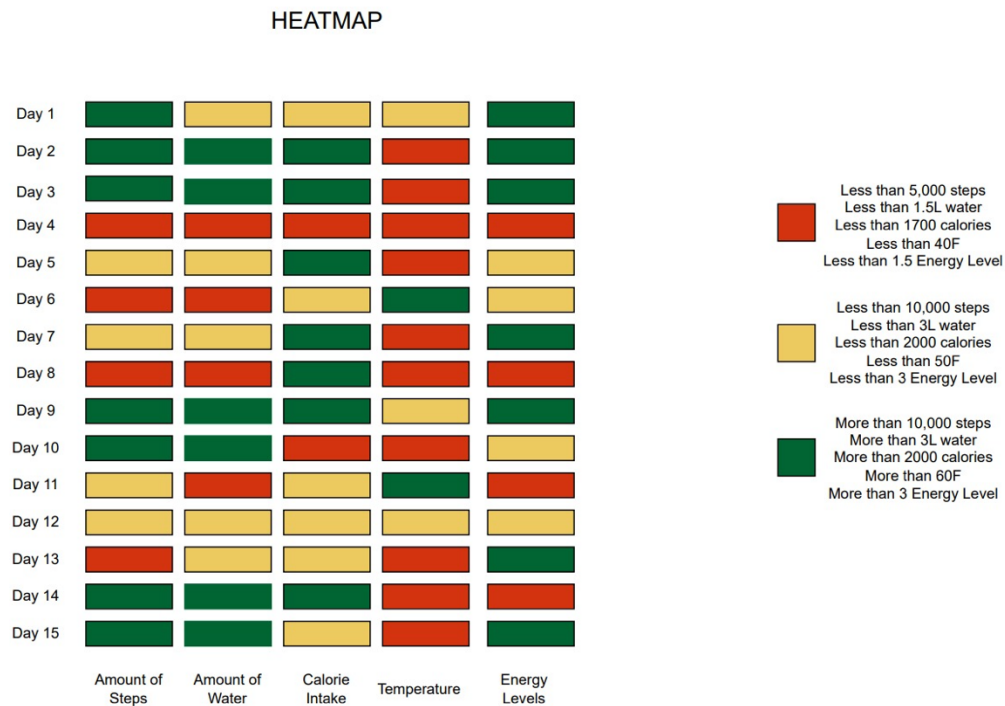


I decided to use 3 properties: Number of Steps, Energy Level and Temperature. I decided to keep it simple with X axis representing Number of Steps, Y axis representing Energy Levels. For displaying temperature, I decided to use 3 different shapes (snow for Temperature ranging from 0-40, clouds for temperature ranging from 41-50 and sun for temperature above 50F).

While the emojis do look appealing, I was not able to see a relation between the temperature and my energy levels. Deriving conclusion was not easy, so this couldn't work.

2) Heat Map

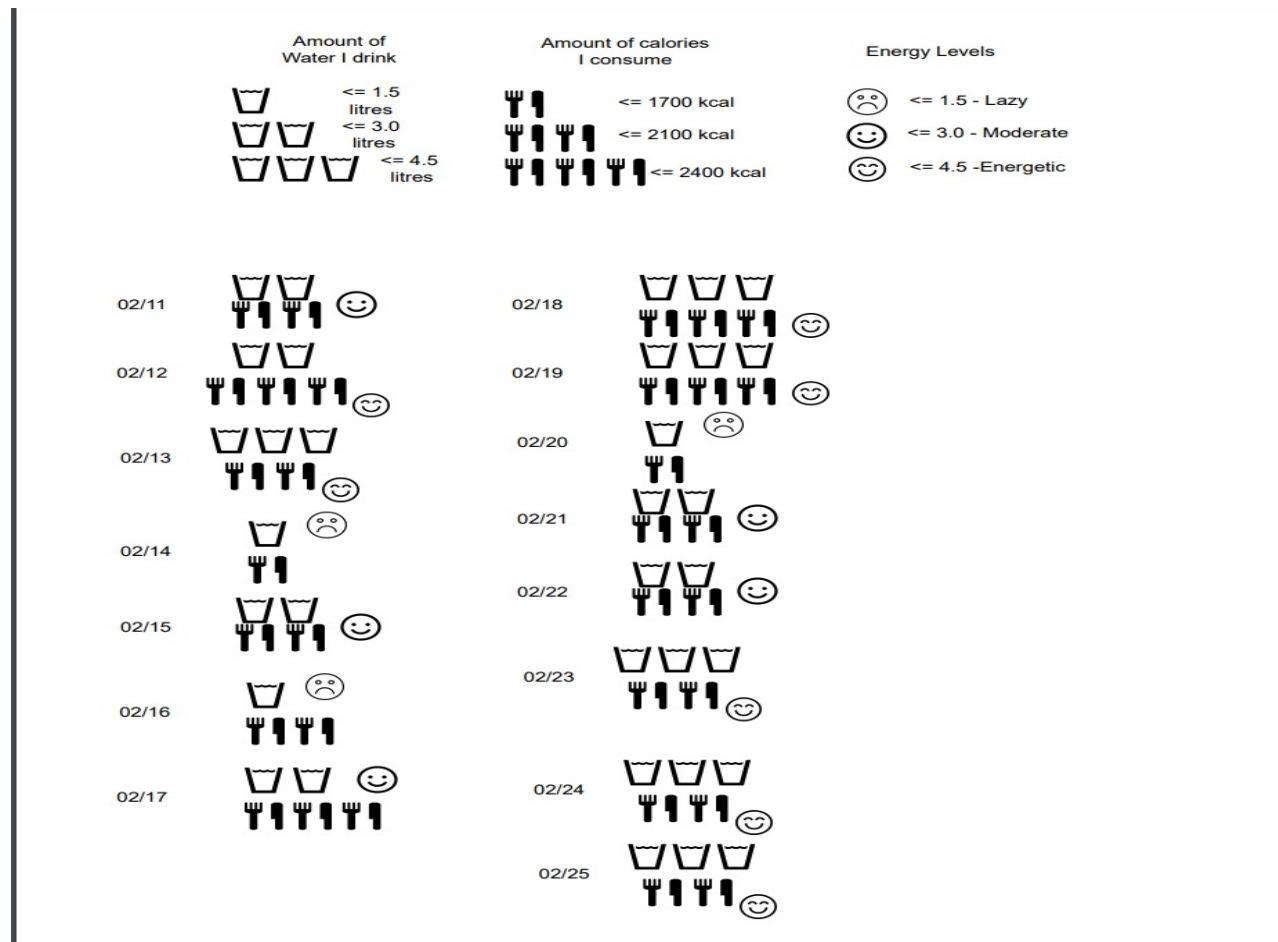
Next idea presented was a Heat Map.



For this Heat Map, I decided to use all the properties from my data, except the Time. It is a graphical representation of my data where the individual values are represented as colors. I used 3 colors- Red, Yellow and Green. Red displays the lowest values for the property, yellow displays average value, and Green represents the highest values.

While heatmaps do look pretty, we cannot see the numbers on it. And it is poorly suited for accurate comparisons. Since my data has more numerical information, I believe a heatmap would not be a good approach.

3) Dot Matrix Chart

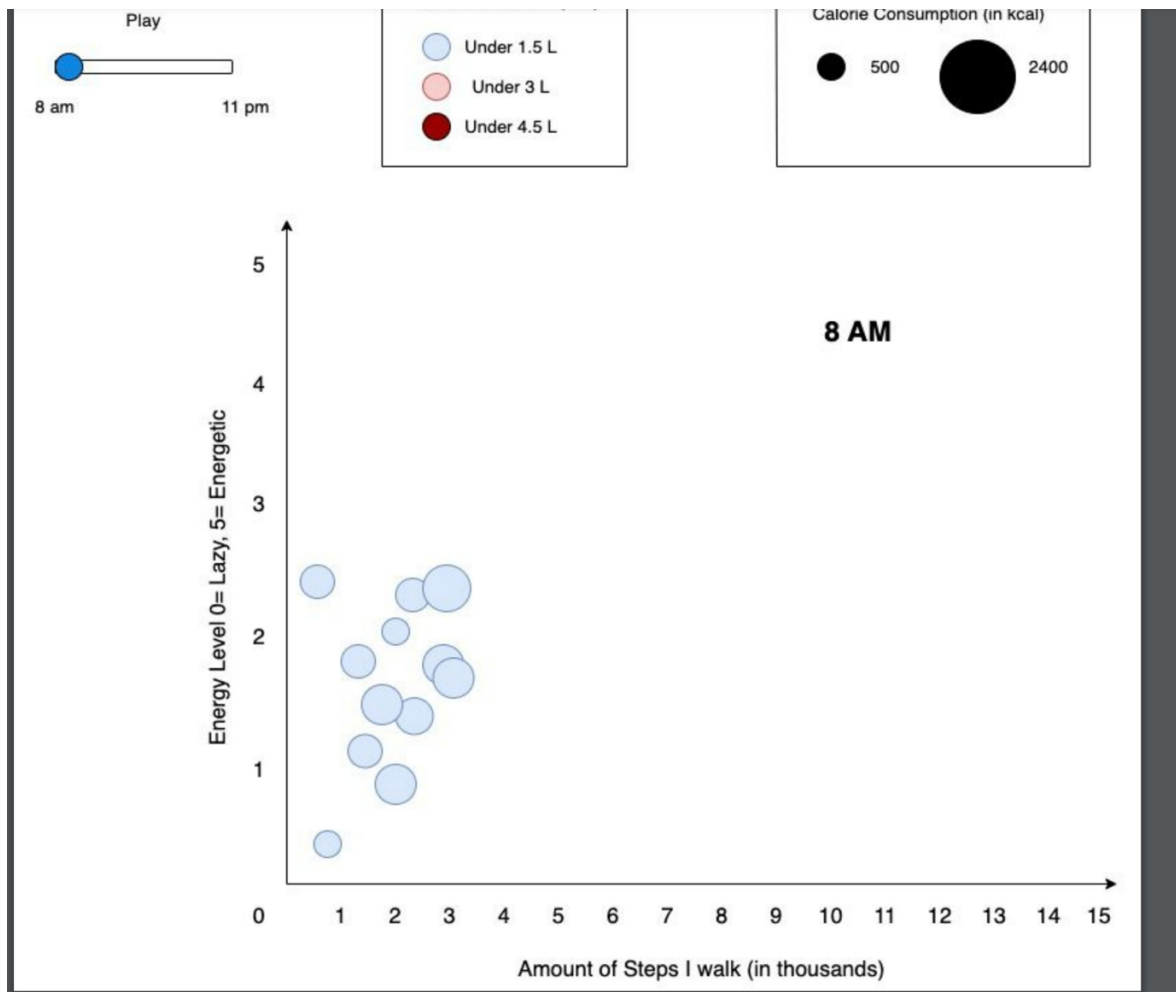


In this data visualization, my idea was to represent my collected data in a form of dot matrix chart. Every data element like amount of water consumed calories consumed are represented by emojis. The Happy or sad face displays the energy levels. For example, if you see 3 forks, it seems I have consumed the most calories that day.

This sketch had some drawbacks. Firstly, this visualization had no x and y axis. This wasn't represented on a 'graph' but more like a chart 'chart'. Secondly, establishing the relationship stated in the hypothesis was not possible and deriving a conclusion was not very easy.

Final Idea

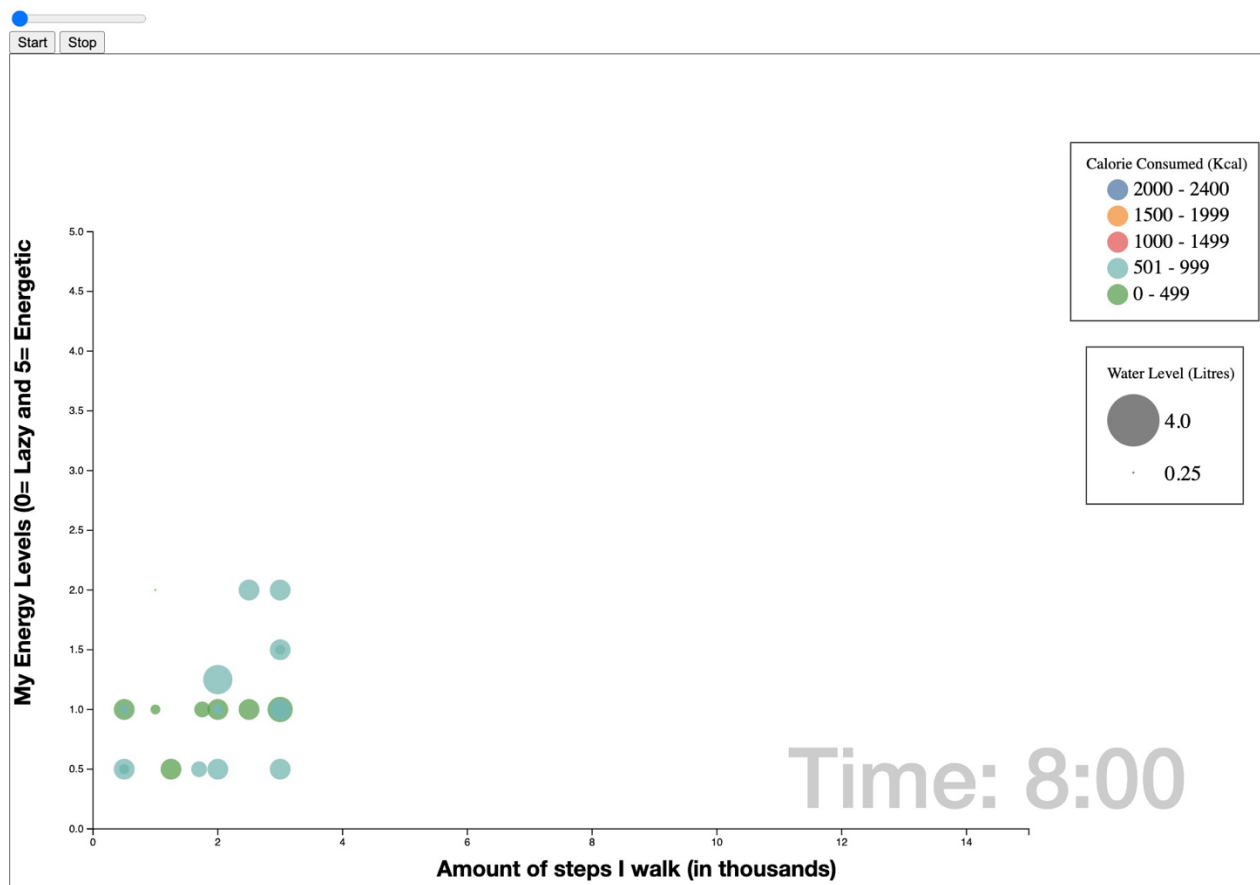
My final idea was an Interactive Scatterplot. Here's what it looked like.



X axis represents the number of steps walked; Y axis represents the Energy Levels. Circle size represents the number of calories consumed and the colors represent the amount of water consumed. I recorded data at 8 am, 1 pm, 6 pm and 11 pm. There is a slider at the top. When the user moves the slider, the circles will move and display data for different times in the whole day.

Final Visualization

For my final visualization, I decided to go with the Interactive Scatter plot that animates changes over time.



For this graph, I gave it my own twist by adding a slider and making it interactive. As we can see above, on the X axis is the Number of Steps, Y axis represents amount of water, colors represent Calorie Consumption and Circle size represent amount of water. This graph correlates all my data efficiently. It answers the question whether my chart and data are understandable enough for the viewer to make out the flow of my data and how my energy levels are being affected.

Analysis

The hypothesis statement for my final visualization is: As the Number of Steps, I walk increases, my Energy Levels increases.

From my data, I learnt to a great extent how my walking habits are directly proportional to my Energy Levels, and how additional factors like my daily food and water intake can also have an impact on my productivity. Initially, I had no idea if my Calorie and Water Consumption are having any major impact.

But after seeing the visualization, I can conclude that; I need at least 9 to 10 thousand steps to stay Energetic all day and to keep my ideas flowing. I also found out that, when I eat above 2.1 kCal I feel productive and function well. Water consumption did not affect me as much I had thought.

I was astonished to know how certain habits, that we may consider trivial, can affect your body to such a great extent. I now understand why I feel lazy on some days thanks to this Scatter Plot. I've always wondered why, but now that I've personally recorded numerical data, it all makes more sense and makes it easier for me to hunt down and gather data on why that occurs. Also, Walking daily has a lot of benefits. A study found that walking 10,000 steps daily greatly reduces the risk of cardiovascular disease, 13 types of cancer and dementia.

Concluding, I can say that the hypothesis that I stated still holds true and this data visualization will also be useful to track my day-to-day activities.

References

Here are some websites that assisted me with my research:

Dot Matrix Chart (no date) *Dataviz Catalogue*. Available at:
https://datavizcatalogue.com/methods/dot_matrix_chart.html. (Used for creating Sketch 3)

Agrawala, M. (2021) *Making D3 charts Interactive*, *Observable HQ*. Available at: <https://observablehq.com/@stanfordvis/making-d3-charts-interactive>. (Used for Sketch 4 and learning how to make Scatter plots Interactive).

Lim, R. (2021) *An Interactive Scatter Plot*, *Medium*. Available at:
<https://medium.com/codex/an-interactive-scatter-plot-e5a01064b17>
(Accessed: March 21, 2023). (Used for learning how to make Scatter plots Interactive)

Holtz, Y. (2021) *Interactive grouped scatterplot in d3.js*, *D3.js Graph Gallery*. Available at: https://d3-graph-gallery.com/graph/scatter_grouped_highlight.html (Accessed: March 30, 2023). (Used for learning about the axis).